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DEPARTMENT OF EDUCATION

Science

Quarter 4 – Module 8.1:
Electricity & Magnetism

ALTERNATIVE DELIVERY MODE
ADM

Science – Grade 9
Alternative Delivery Mode
Quarter 4 – Module 8.1: Electricity and Magnetism
First Edition, 2020

Published by the Department of Education
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Undersecretary: Diosdado M. San Antonio

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Printed in the Philippines by _____

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Science

Quarter 4 – Module 8.1:
Electricity and Magnetism

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

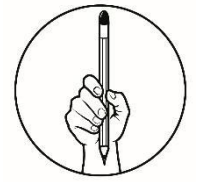
At the end of this module, you should be able to:

1. Explain how electrical energy is generated, transmitted and distributed

   Code: **S9FE-IVh-j-46**

Specifically, as you go through with the lessons, you will be able to:

1. Identify the steps in generating electrical energy in power plants
2. Describe the process in the generation of electrical energy in power plants
3. Appreciate the role of renewable energy resources in generating electrical energy
4. Explain the steps in the transmission and distribution of electrical energy from the power plants to the households.



What I Know

I. Multiple Choice: Read each question carefully. Choose the letter of your answer and Write on the space provided before each number.

_____1. What energy transformation takes place in a generator?

A. electrical to mechanical
B. heat to mechanical
C. mechanical to electrical
D. chemical to electrical

_____2. In which of the following stages of providing electricity to consumers is a generator useful?

A. production of electricity in power plants
B. distribution to individual consumers
C. transmission from power plant to substation
D. transmission from substation to local distribution

_____3. What do you call a facility that produces electricity from energy sources?

A. generator
B. national grid
C. power plant
D. transformer

_____4. Which of the following is produced by the solar panels in a solar power plant?

A. AC electricity
B. radioactive material
C. steam
D. DC electricity

_____5. Which of the following is the correct sequence in the process of generating electrical energy in power plants?

A. turbine ➡ source ➡ generator ➡ electrical energy
B. source ➡ turbine ➡ generator ➡ electrical energy
C. turbine ➡ source ➡ generator ➡ electrical energy
D. source ➡ generator ➡ turbine ➡ electrical energy

_____ 6. In which phase of electricity distribution is a pole transformer useful?

A. generation of electricity
B. distribution of individual consumers
C. transmission from power plant to substation
D. transmission from substation to local distribution

_____ 7. Which of the following devices raises voltage so that it can travel to long distances?

A. power plant
B. pole transformer
C. step-up transformer
D. step-down transformer

_____ 8. Which of the following is the correct order of steps for the transmission and distribution of electricity to the consumers?

1 Distribution Substation
2 Power Plant
3 Transmission Station
4 Consumers

A. 1 2 3 4 B. 4321 C. 2 3 1 4 D. 3 2 1 4

_____ 9. What happens to the voltage that travels from the power plant to households?

A. The voltage is stepped-up before being distributed to consumers.
B. The voltage is lowered during transmission.
C. The voltage is stepped-up for transmission and step-down before being distributed.
C. The voltage is stepped-down for transmission and stepped-up before being distributed.

_____10. Cathy switched on a lamp in her room. Which of the following is the correct path of electricity from the power plant to Cathy's home?

A. power plant ⇒ transmission substations ⇒ distribution substations⇒residences
B. power plants ⇒ distribution substations ⇒transmission substations ⇒ residences
C. power plants ⇒ electric meter ⇒ national grid ⇒ residences
D. power plants ⇒ distribution substations ⇒ national grid ⇒ residences

Lesson 1 Electrical Energy Generation

What's In

Electrical energy is defined as energy that results from the movement of charges since technically we view it as equal to the electrical potential energy and the work done in moving charges from a point to another.

In our homes, there are many appliances that operate with the use of electricity. These electrically-powered appliances provide us comfort and facilitate the performance of certain tasks. This is made possible because electrical energy is brought to our homes and to the different parts of our houses. Television, electric fans and refrigerator are some examples of the appliances that use electricity in our households.

Apart from the examples above, can you still think of other appliances that use electrical energy? Write as many as you can.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Can you describe the function of each appliance you listed above? Example: oven toaster – heating bread

Appliance	Function

Question?

Which appliance do you think consumes most electricity?

_____

_____

What's New

Electrical energy is a precious commodity. It keeps a nation alive. It runs industries, transportation and communication facilities and infrastructure. It makes our daily living convenient.

Electricity powers all our gadgets and appliances at home. Have you ever wondered how electrical energy is generated in the power plant? What processes does electricity have to go through in order to reach our homes?

Activity: Word search

Direction: From the word bank below find the hidden words inside the box. You can mark it vertically, horizontally and diagonally.

T	**I**	**N**	**V**	**E**	**R**	**T**	**E**	**R**	**I**	**J**
K	**U**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**
U	**V**	**R**	**U**	**X**	**Y**	**Z**	**K**	**L**	**M**	**N**
O	**P**	**Q**	**B**	**R**	**S**	**T**	**U**	**V**	**W**	**X**
Y	**Z**	**A**	**B**	**I**	**C**	**D**	**E**	**S**	**F**	**G**
H	**I**	**J**	**K**	**L**	**N**	**M**	**N**	**O**	**O**	**P**
Q	**R**	**S**	**T**	**U**	**V**	**E**	**W**	**U**	**X**	**Y**
G	**E**	**N**	**E**	**R**	**A**	**T**	**O**	**R**	**Z**	**A**
B	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**C**	**J**	**K**
L	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**E**	**T**	**U**
E	**L**	**E**	**C**	**T**	**R**	**I**	**C**	**I**	**T**	**Y**

WORD BANK SOURCE TURBINE GENERATOR INVERTER

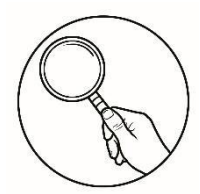
How can you describe each of them? Below are phrases or sentences that describe the words in the word bank. Identify the word that matches with the correct description below**.**

_____1. Is a rotary engine that converts energy of moving stream of water, steam or gas into mechanical energy.

_____2. The raw material used in generating electrical energy.

_____3. A device that converts direct current (DC) electricity, which is what a solar panel generates, to alternating current (AC) electricity, which the electrical grid uses.

_____4. A device that converts mechanical energy to electrical.



What is It

Various sources of energy are utilized to produce electricity to power our households. A *power plant or power station* is a facility where electricity is generated from energy sources. The source of energy which turns a turbine determine the type of power plant. There are various types of power plants. The Philippine Energy Plan 2018-2040 aims to increase the production of clean and indigenous energy resources for power generation to make our country self-reliant and less dependent on imported fuel while at the same time reducing dollar expenditures.

Hydroelectric power was among the first indigenous sources tapped. It is the least expensive among other types of power plants in terms of operating cost. Late last year, the Department of Energy reported that it is evaluating several large-scale power projects that could receive certification as being energy projects of national significance under Executive Order No. 30 that streamlines the procedures for major projects.

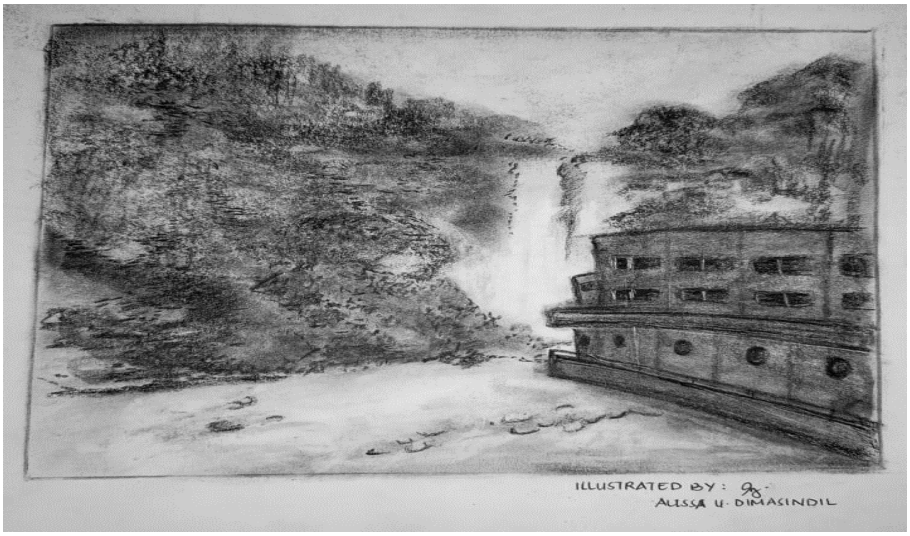
The projects being considered include the Wawa pumped-storage hydro project; the 500 MW Kibungan Badeo pumped storage hydro scheme; and the 100.8 MW solar farm by Total Power Inc.

Other projects that filed applications and under evaluation with the Department of Energy are the 10 MW Pulangi IV hydropower project in Pangasinan; hydro projects in Pampanga and Batangas; the 70-MW Camarines Sur wind power project; the 1.7 MW Tagpangi river hydro scheme and the 20 MW Sablan 1 hydro power project.

The Philippines has developed large scale solar power farms. They can be found in Cavite, Pampanga, Ilocos Norte and Cagayan de Oro. The Calatagan Solar Farm is a 63.3 MW solar power plant in Calatagan, Batangas owned by Solar Philippines.

It was reported that the groundbreaking for the solar facility was done as early as March 2015. Solar Philippines, a local company, developed the project which cost ₱5.7 billion. The facility was built by 2,500 people in a 160 hectares (400 acres) land near the foot of Mount San Piro. Upon its completion, the solar farm has 200,000 panels.

Have you seen a hydroelectric power plant? What about a solar farm? Can you describe how they generate electrical energy? Study the figures below:



Agus 1 Hydropower Plant, Maria Cristina Iligan City

A hydroelectric power plant uses water to run a turbine. Water is stored in a reservoir through dams.

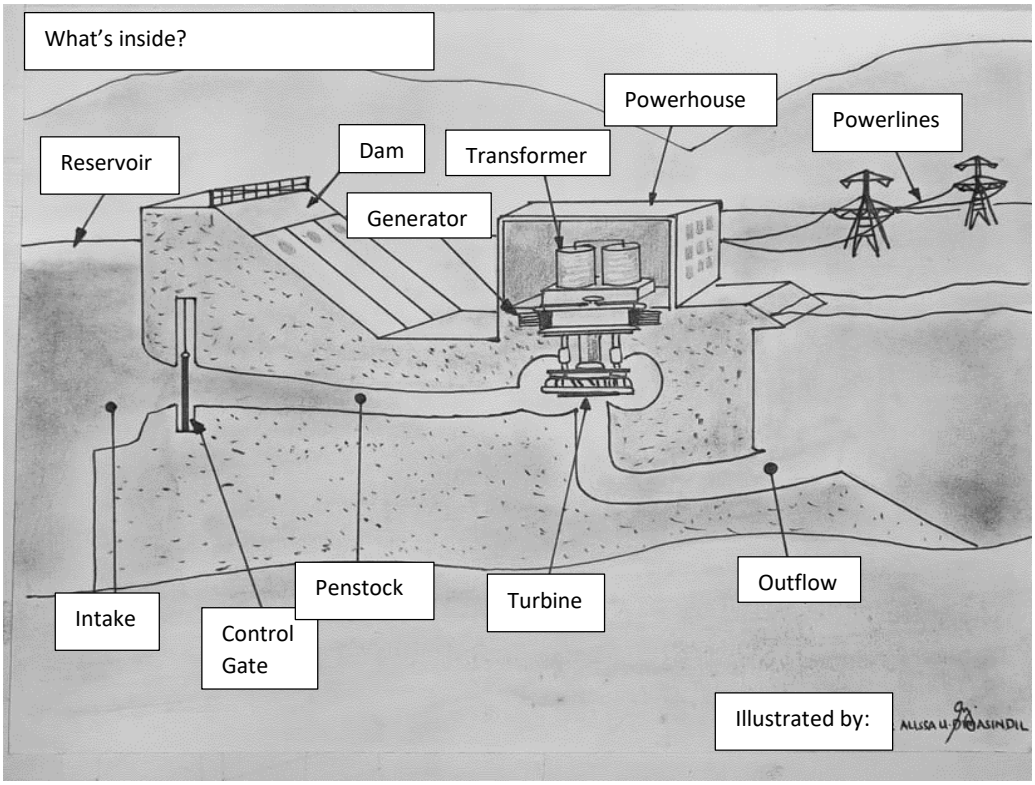


Figure 1.2. Parts of a Hydropower Plant

A dam is a barrier that stops or prevents the flow of water or underground streams. Water is then regulated to fall or flow into a turbine. As the water falls from the reservoir, gravitational potential energy is converted to kinetic energy. Its kinetic energy increases and it flows very fast. The falling stream of water turns a fan-like device called a turbine, which is connected to a large generator's shaft as shown in Figure 1.3 below.

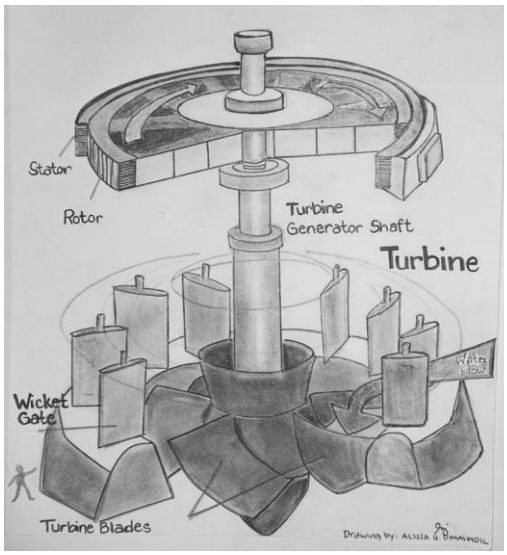


Figure 1.3 Generator

The rotation of the shaft turns powerful electromagnets that are surrounded by a coil of copper wires. This device is called a generator which converts mechanical energy into electrical energy. It works on the principle of electromagnetic induction. A conductor coil is rotated rapidly between the poles of a horseshoe magnet. The magnetic field will interfere with the electrons in the conductor to induce a flow of electric current inside it. Electric current is generated as a result.

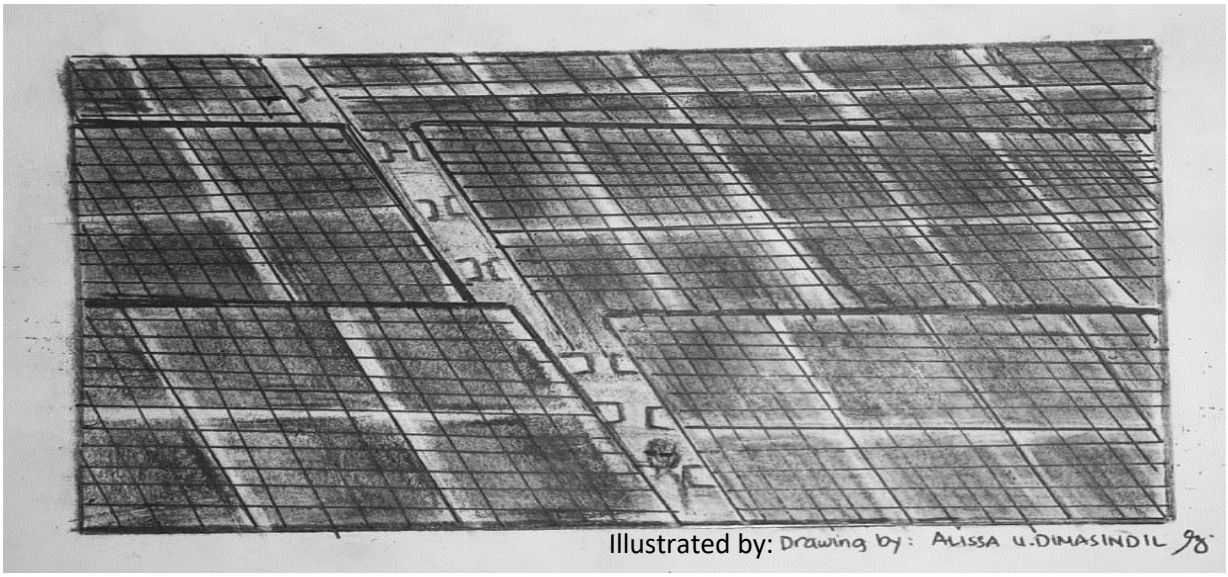


Figure 2.1 Solar Farm

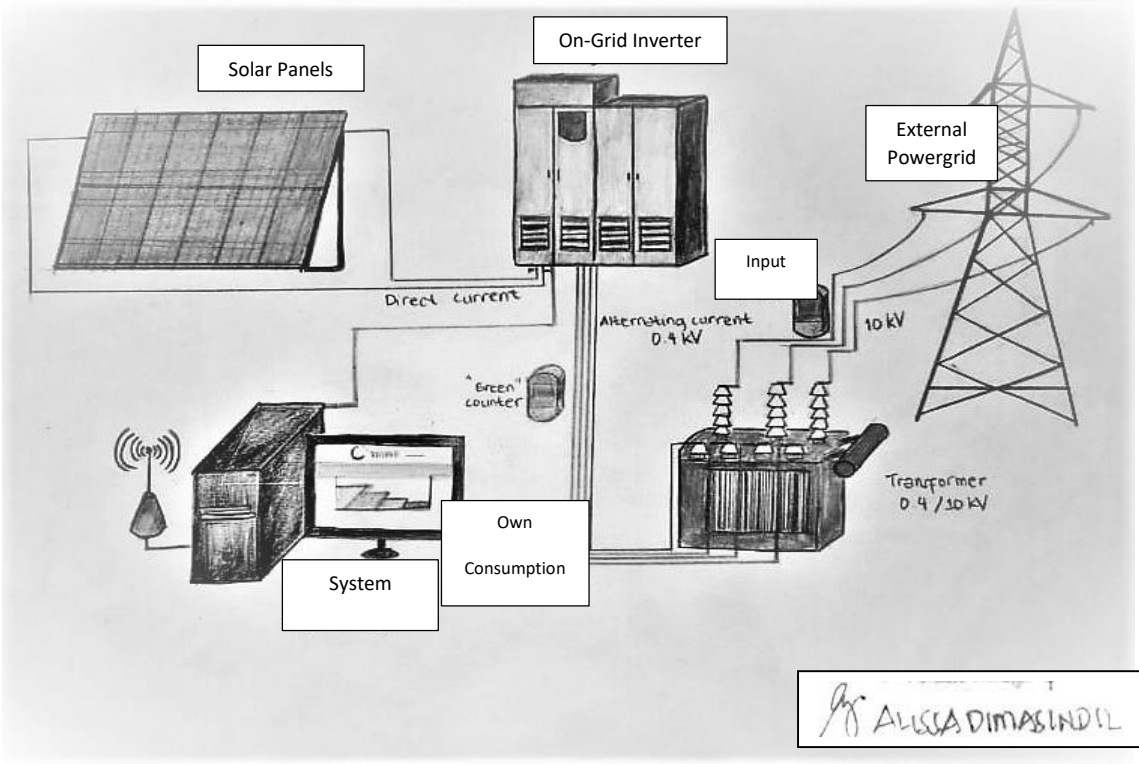
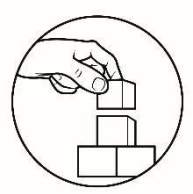


Figure 2.2 Photovoltaic Power Plant

Solar energy incident on land can be directly transformed to electrical energy through the use of photovoltaic or solar cells. Harnessing solar energy on a large scale through this method is best for places which are 20° south and 20° north of the equator. The Philippines is within this area hence putting up a photovoltaic power plant is feasible.

An experimental photovoltaic power plant has been put up in Pulong Sampaloc, Doña Remedios Trinidad, Bulacan. It has an output power of 13 kW which is roughly 50 kWh. It is composed mainly of solar cells which are arranged in panels. Since conversion of solar to electrical energy is done in the solar cells, no moving parts such as generators are involved. It is an ideal plant especially because the fuel is free.

How does solar panels work? Sunlight hits the solar panels, and creates an electric field. The electricity generated flows to the edge of the panel, and into a conductive wire. The conductive wire brings the electricity to the inverter, where it is transformed from DC electricity to AC, which is used to power buildings. Another wire transports the AC electricity from the inverter to the electric panel on the property (also called a breaker box), which distributes the electricity throughout the building as needed. Any electricity not needed upon generation flows through the utility meter and into the utility electrical grid. As the electricity flows through the meter, it causes the meter to run backwards, crediting your property for excess generation.

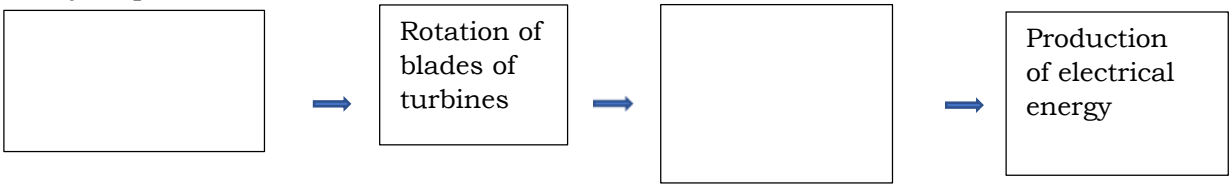


What's More

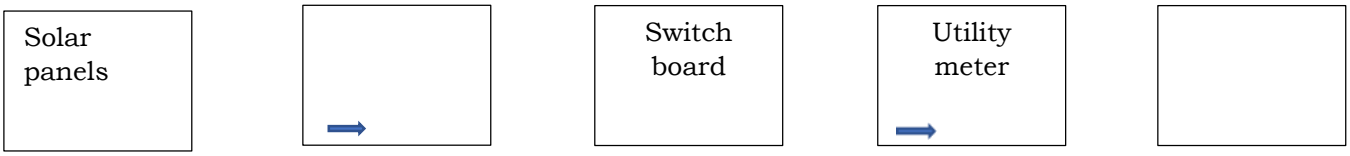
Flow Diagraming

Fill in the boxes below to show the correct flow of the process of generation of electrical energy in the power plant.

A. Hydropower Plant



B. Solar Power Plant



What I Have Learned

I. True or False

Determine whether the given statement is true or false. Write T if the statement is true and F if it is false. Provide explanation why the statement is false. Place your answers on your notebook.

_____1. Electrical energy can be generated even without a turbine.
_____2. In a hydroelectric power plant, water is used to produce steam to make the turbines rotate.
_____3. In a solar power plant, AC electricity is produced using an inverter.
_____4. The electrical energy generated all the way from the sun, converted into renewable power is distributed through the grid.
_____5. Electrical energy produced by power plant generators is useless unless delivered to the consumers.

Lesson 2 Electrical Energy Transmission and Distribution

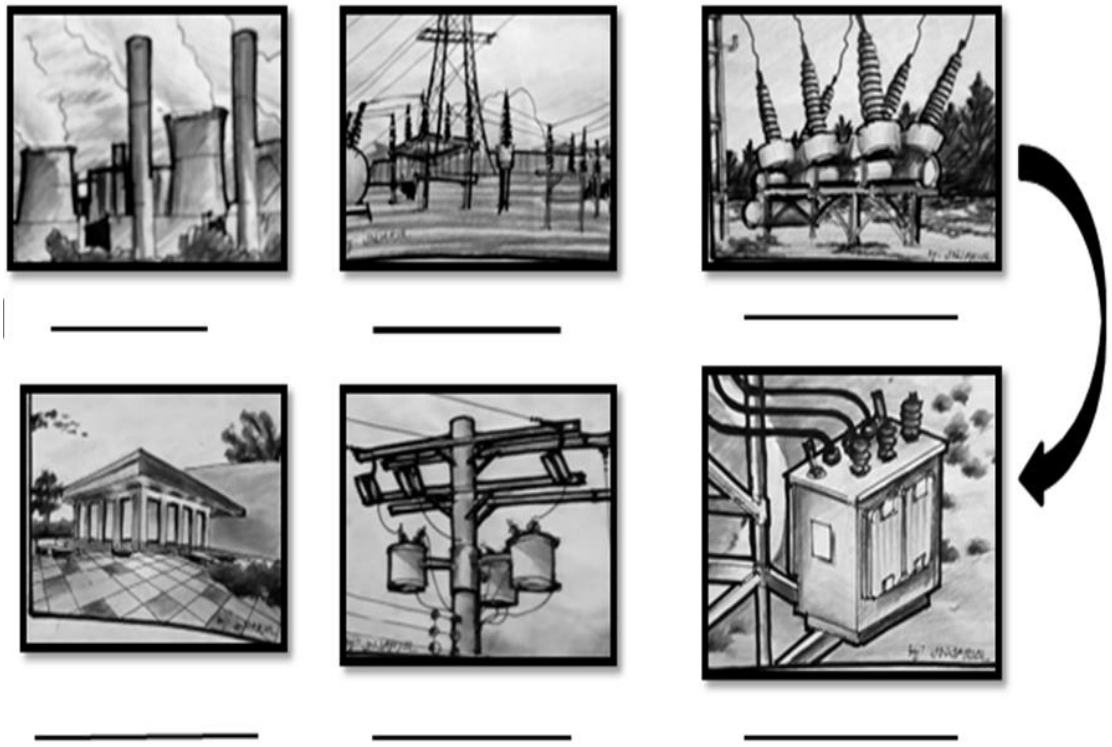
What's In

In the previous lesson, you learned how electrical energy is generated in power plant. Before the electricity can be delivered to consumers, can you identify the different stages of power transmission and distribution?

Activity 1: GUESS What Step?

Try to guess the correct step in transmitting and distributing electrical energy. Choose your answer on the word box.

WORD BOX		
Distribution Substation	Power Plant	Transmission Substation
Consumer	Transmission Station	Distribution Pole



Did you get the right answer? The electrical energy is generated at the power station. Electricity is then passed through the transmission station which uses a large transformer. Then electricity will then move to the distribution substation which uses a smaller transformer mounted on a distribution pole and finally it will be distributed to the consumers. A service drop wire provides a path for the power from the distribution pole to your house.

In Mindanao, Maria Cristina Falls is a source of the hydroelectric power plant that has been used as source of electricity. In the next activity, the process of distributing and transmitting electrical energy is discussed.

What's New

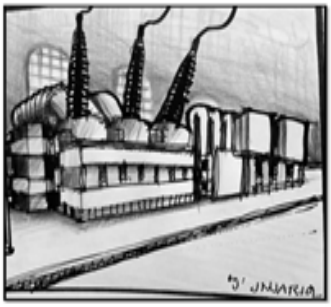
Electrical energy is produced from various sources in power plants. Providing electrical energy to the households consists of three processes: generation, transmission and distribution. Lesson 1 discussed how electricity is generated in power plants. Before studying the different stages on how electricity is transmitted and distributed to your home, first you need to do Activity 2 - Connect Me. Draw a line to connect the equipment (Column A) used in electricity transmission and distribution to its corresponding functions (Column B).

Column A	Connect Me	Column B
1. Power Plants	•	A. further reduce voltage before it reaches to your home
2. Step Up transformer	•	B. carry electricity to your home
3. Transmission lines	•	C. lowers the voltage
4. Step Down transformer	•	D. carry electricity over long distances
5. Distribution lines	•	E. increase the voltage
6. Pole transformer	•	F. generates electricity

Are your connections correct? Try to analyze the diagram below to know if your answers are correct.

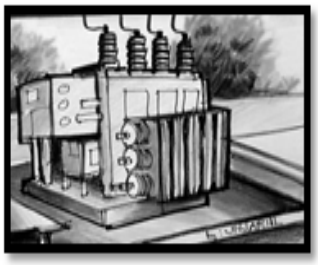
ELECTRICITY TRANSMISSION AND DISTRIBUTION

Power plant generates electricity



Transformer step voltage for Transmission

Transmission lines carry electricity over long distances

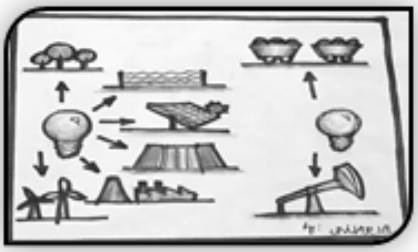


Neighborhood transformer steps down voltage

Distribution lines carry electricity to your home

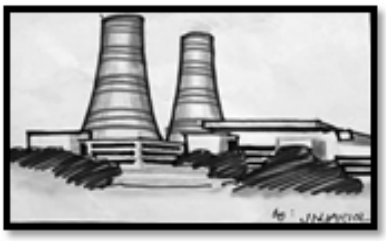
Pole transformer step down further reduce voltage before it enters your home.

Activity 3 will help you identify the stages when electricity is transmitted and distributed. Draw a star (☆) if the picture and description match. If not, draw a diamond (◊) . Draw your answer in the empty box provided.



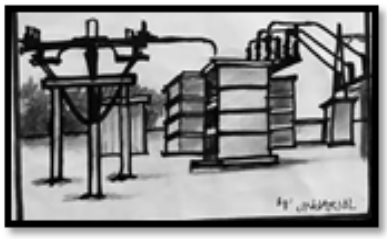
☐

Electricity is generated using either renewable or nonrenewable sources such as fossil fuels, water, sun, wind, coal, tides, nuclear or natural gas



☐

A power plant also referred to as generating plant is a facility where electricity is generated. Using a source to turn the turbine, which in turn rotates either the coil or magnets of generator to produce electricity



☐

Transmission lines are electrical conductors that serves as a path for transmitting electrical energy from substation that delivers power over large distances

☐

The substation consists of step-up transformer. A step-up transformer has more turns of wire in the secondary than on the primary. It is designed to converts low voltage-high current to high voltage-low current thus voltage is stepped up for transmission.

A distribution transformer usually mounted on a utility pole that provides the final voltage transformation in the electric power distribution system, reduces power into usable voltage level, each serves as 1 to 15 customers.

This substation consists of step-down transformer. A step-down transformer converts a high voltage and low current source to a low voltage and high current supply.

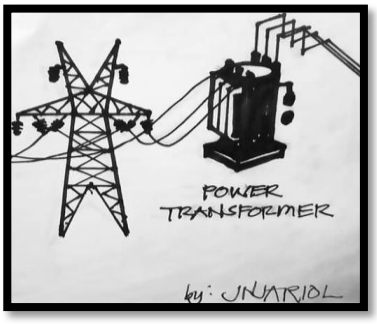
The energy used to power up our homes is called electrical energy. It has been useful and become convenient to use because it can be changed into heat, light, mechanical and sound energy.

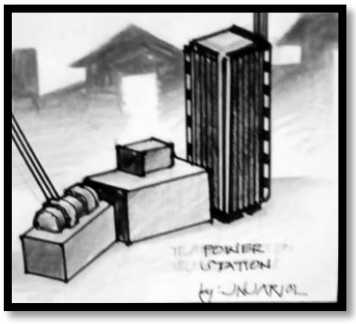
What is It

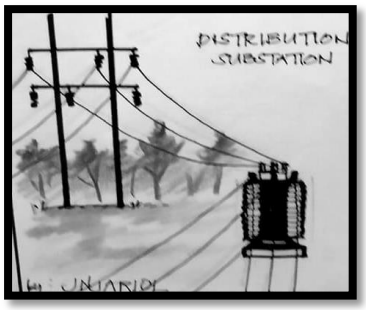
In general, power plants use a generator to convert kinetic energy to electrical energy. The transmission and distribution of electrical energy refer to the different stages of carrying electricity over poles and wires from power plant to your home. So how does the distribution of electricity take place? How is electricity transmitted and distributed?

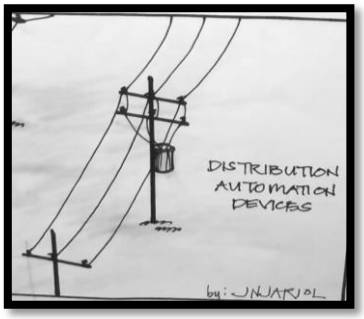
Do Activity 4. Arrange Me. Pictures shown are the different stages of electricity when transmitted and distributed, rank the pictures from 1-6, 1 is the initial step and 6 as the final step.

Electricity Transmission and Distribution









Electrical power transmission involves massive movement of electrical energy from power plants to an electrical substation where voltage is transformed and distributed to consumer.

Step 1. Power plants generate electricity.

Electrical energy is generated at the power station (also referred to as power plant) by huge generator. During the electricity generation stage, high voltage of electricity is produced.

Step 2. Transformer step up voltage for transmission

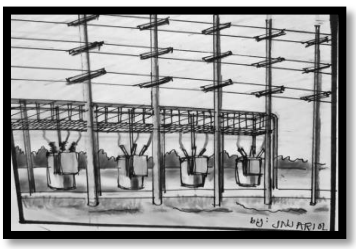
The current generated from power plants is sent through transformers to increase the voltage. A transformer that is designed to increase the voltage is called a step-up transformer.

Step3. Transmission lines carry electricity over long distances.

Transmission is the movement of electricity from a generating site to a substation where it is distributed to homes. Transmission lines are constructed overhead electrical towers or underground. They carry electricity at high voltage from the power to a substation.

Step 4. Neighborhood transformer step down voltage.

A step-down transformer lowers voltage in distribution lines. Voltage is lowered in preparation for distribution to households. Distribution substation uses a smaller step down transformer to decrease the voltage so that it can be sent through distribution poles.

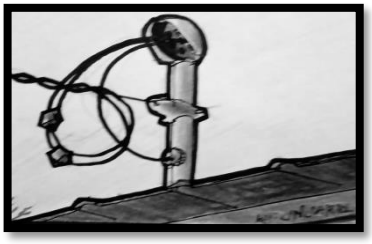


Step 5. Distribution lines carry electricity to house.

Electricity travels through small transmission lines called distribution lines toward your home. These electric lines conduct lower voltage of electricity.

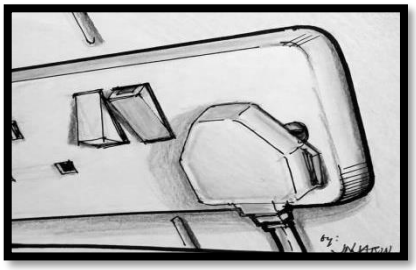
Step 6. Pole transformer step down electricity before it enters home.

Pole step-down transformer further reduce the voltage before it enters our house. A small transformer mounted on a distribution pole further reduces the voltage to 110-220V. This is done to ensure that only 220 V goes into our homes.

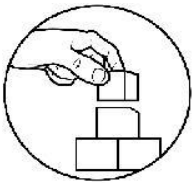


A service drop wire provides path for the power from the distribution pole to the house.

In the house, the control panel distributes power through wires in the walls and through a meter that measures the amount of electrical energy used.



If we plug-in our appliances, we complete a circuit powered by the power plant, thereby making the lights and appliances work



What's More

Activity 5. Hint: Use the given numbers to decipher the process in transmitting and distributing electrical power to consumers.

Transmission & Distribution

A	B	C	D	E	F	G	H	I	J	K	L	M
19	18	16	8	23	11	22	1	15	25	4	2	6

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
21	9	13	26	3	14	10	24	17	5	20	12	7

A)___ ___ ___ ___ ___ ___ ___ ___ ___ ___

13 9 5 23 3 13 2 19 21 10

B) ___ ___ ___ ___ - ___ ___

14 10 23 13 24 13

C)___ ___ ___ ___ - ___ ___ ___ ___

14 10 23 13 8 9 5 21

D)___ ___ ___ ___ ____ ___ ___ ___ ___ ___ ___ ____ ___ ___ ___ ___ ___

. 10 3 1 9 21 14 6 15 14 14 15 9 21 2 15 21 23 14

E)___ ___ ___ ___ ___ ___ ___ ___ F) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

16 9 21 14 24 6 3 14 14 24 18 14 1 0 19 10 15 9 21

G) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

8 15 14 10 3 15 18 24 10 15 9 21 2 15 21 23 14

Activity 6.

Identify the following statement as FACT or BLUFF. If the statement is true, write FACT and if the statement is false write BLUFF on the space before the number.

_____ 1. Power plant generates electricity.

_____ 2. Step-up transformers reduce the output voltage.

_____ 3. Transmission lines transport high-voltage electricity over long distances.

_____ 4. Distribution lines carries electricity at lower voltage.

_____ 5. Neighborhood transformer lowers voltage to an amount that can be safely used by appliances at home.

_____ 6. Pole step-up transformers further reduce the voltage before it enters your home.

_____ 7. Electric meter measures the amount of electrical energy used.

_____ 8. In the house, the control panel distributes power through wires on the wall.

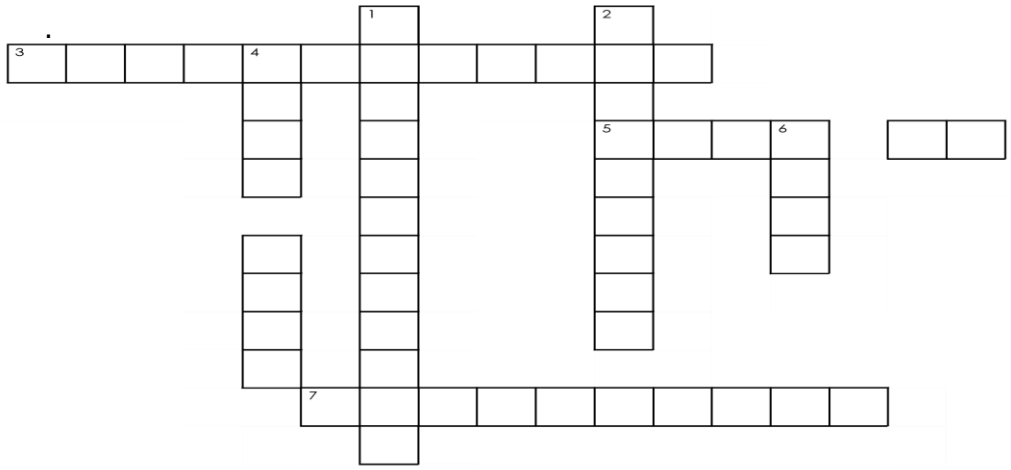
_____ 9. A big transformer is mounted on a distribution pole.

_____ 10. Distribution substation uses big transformer to step up voltage.

What I Have Learned

Activity 7. **Crossword Puzzle**. In the previous lesson, you learned how electrical energy is generated in a power plant. Before the electricity can be delivered to consumers, can you identify the different stages of power transmission and distribution? Do the activity Crossword Puzzle. Direction: Complete the crossword puzzle by filling in the correct word that describe the given clue.

Transmission & Distribution



Across: → Down: ↓

3. lines carry electricity long distances
5. transformer increases voltage
7. generates electricity
1. lines carry electricity to houses

2. one's uses electricity
4. transformer decreases voltage
6. transformer step down electricity

WORD BANK

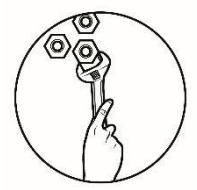
TRANSMISSION	DISTRIBUTION	STEP-DOWN
STEP-UP	POWER PLANT	CONSUMERS
POLE		

Activity 8. Fill in the blank. Study the paragraph below which contains missing terms.

Use the words in the WORD BOX to fill in the blanks. Write your answer on your notebooks.

WORD BOX				
generated	distribution	substation		transmission
territory	hydropower plant	solar	wind	nuclear
household				

After electrical power is (1) _____, it is transmitted over long distances using (2) _____ lines. Transmission lines are connected between transmission (3) _____ located at electric generating stations. This (4) ____ is then carried through lines to the distribution system located in the local service (5) _____. The generation of electric power are from different sources. The generation of electric power are from different sources. These are; (6) _____, (7) _____, (8) _____, (9) _____ and are transmitted and distributed to different (10) _____



What I Can Do

With the knowledge of how the electrical energy is generated, transmitted, and distributed to the consumers, do the following task. Suppose you hear that your mother inherited a vast area of land and with many waterfalls which can be a great source of hydroelectric energy. A private investor had negotiated already with your mother about the possibility of constructing a hydroelectric power plant. Your mother wants to know more about this power plant. Your task is to make an illustration, model, or representation of how the hydroelectric power plant works to allow your mother to understand the whole process. You may use ¼ illustration cardboard, indigenous and recyclable materials in creating your illustration. Refer to the criteria in designing your model.

Your output will be graded by the following criteria:

Rubric in rating your model

Category	10	7	4
Creativity	The model displays 6 and above indigenous materials	The model displays 4-5 indigenous materials	The model displays 3 and below indigenous materials
Scientific thoughts/Content	The 3 processes are present, and connection is correct	The 3 processes are present, but the 2 processes are not connected	The 3 processes are present but there is no connection at all.
Clarity/ Style & organization	The 3 processes are organized & followed correct dimensions	2 involved processes interchanged to the other but followed the dimension	The 3 processes are not organized and did not follow the dimensions
Appearance	5 and above graphics were used and look attractive	3 graphics were used and does not look attractive	All graphics used were not attractive

Summary

- A Power plant is a facility where electricity is generated from either renewable or non-renewable energy sources such as a solar plant or a coal-fired power plant .
- Generator is a device that converts mechanical energy into electrical energy.
- Hydroelectric power plant uses water to turn the turbine attached to generator, thus electricity is generated.
- Transmission lines are power cables that carries high voltage electricity over long distances.
- Distribution lines carries electricity at lower voltage and is used to distribute power to the end consumers.
- The basic equipment to provide consumer with electricity are the turbine, the generator, and the transformer. The turbine is a rotating shaft with blades. A generator converts mechanical energy into electrical energy, a transformer either increases or decreases the voltage.
- There is always power loss as electricity is transmitted from power plants to consumers because of resistance of the wires.

Assessment

I. Multiple Choice: Read the statements carefully. Choose the BEST answer. Write the letter of your answers on the space provided before each number.

_____1. What energy transformation takes place in a generator?
A. electrical to mechanical
B. heat to mechanical
C. mechanical to electrical
D. chemical to electrical

_____2. During which stage of providing electricity to consumer is a generator used?
A. generation stage
B. distribution to individual consumers
C. transmission from power plant to substation
D. transmission from substation to local distribution

_____3. What do you call a facility of producing electricity from energy sources?
C. generator
D. national grid
C. power plant
D. transformer

_____4. Which of the following is produced by the solar panels in a solar power plant?
A. AC electricity
B. radioactive material
C. steam
D. DC electricity

_____5. Which of the following is the correct sequence in the process of generating electrical energy in power plants?
A. turbine ➡ source ➡ generator ➡ electrical energy
B. source ➡ turbine ➡ generator ➡ electrical energy
C. turbine ➡ source ➡ generator ➡ electrical energy
D. source ➡ generator ➡ turbine ➡ electrical energy

_____ 6. During which stage of providing electricity to consumers is a pole transformer used?
A. generation of electricity
B. distribution of individual consumers
C. transmission from power plant to substation
D. transmission from substation to local distribution

_____ 7. Which of the following devices raises voltage so that it can travel to long distances?
A. power plant
C. step-up transformer
B. pole transformer
D. step-down transformer

_____ 8. Give the correct order of transmission and distribution of electrical energy to consumers.

1 Distribution Substation 2 Power Plant 3 Transmission Station 4 Consumers

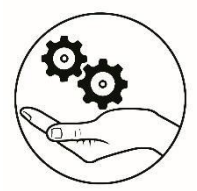
A. 1 2 3 4
B. 4 3 2 1
C. 2 3 1 4
D. 3 2 1 4

_____ 9. What happens to the voltage that travels from the source to household?

A. The voltage is stepped-up before being distributed to consumers.
B. The voltage is lowered during transmission.
C. The voltage is stepped-up for transmission and step-down before being distributed.
D. The voltage is stepped-down for transmission and stepped-up before being distributed.

_____10. Cathy turned on a lamp switch on her room. Which of the following is the correct path of electrical power that can be traced back to the source?

A. power plant ⇒transmission substations ⇒distribution ⇒substations⇒residences
B. power plants ⇒distribution substation ⇒transmission substations⇒residences
C. power plants ⇒electric meter ⇒national grid ⇒ residences
D. power plants ⇒distribution substations ⇒national grid ⇒ residences



Additional Activity

Sequencing. Arrange the following statements in sequence by labeling them from A to E.

_____1. From the generator, transformers step the voltage up ranging from 138,000 to 765,000 V for the long-distance primary transmission line.
_____2. In a distributing substation, a set of transformers step the voltage down to the distribution level of 2,400 or 4,160 volts.
_____3. At the distribution transformer, the voltage is reduced to 240 volts near the point of use.
_____4. The generators at the power station deliver a voltage from 1,000 to 26,000 volts.
_____5. At the substation, the voltage is transformed down to levels of 69,000 to 138,000 volts.

Answer Key

Lesson 1

What I Know (Pretest)

1.C 2. A 3. C 4. D 5. B 6. B 7. C 8. C 9. C 10. A

What's In

1. Answers vary

What's New

1. Source 2. turbine 3. generator 4. inverter

What's More (page 5)

A. Production of source to rotate a turbine----rotation of blades of turbine---rotation of coils or magnets of the generator-----production of electrical energy

B. Solar panels----Inverter------Switch Board------Utility Meter-----Grid

What I have Learned (True or False)

1. T-
2. F- kinetic energy
3. F- directly connected to a turbine
4. T

Lesson 2

What's In (Activity 1)

1. Power Plant 2 Transmission Station
3. Transmission substation 4 Distribution Substation
5 Distribution Pole 6 Consumers

What's New (Activity 2)

1. F 2. E 3. D 4.C 5. B 6. A

Activity 3

1. star 2. star 3. diamond 4. diamond 5. diamond
6. star 7. star

What is it

Activity 4. 2, 6, 1, 3, 4, & 5

What's More

.Activity 5 Decipher

A) Power Plant B) Step-up C) Step-down D) Transmission lines
E) Consumers F) Substation G) Distribution lines

. Activity 6

1. Fact 2. Bluff 3. Fact 4. Fact 6. Fact
7. Bluff 7. Fact 8. Fact 9. Bluff 10. Bluff

What I Have Learned

Activity 7.Crossword Puzzle

3 Transformer 5 Step-up 7 Power Plant 1 Distribution
2 Consumers 4 Step-down 6 Pole

Activity 8. Fill in the blanks

1. generated 2. distribution 3. substation
4. transmission 5. territory 6. hydropower plant
7. solar 8. wind 9. nuclear
10. household

Assessment (Posttest}

1.C 2. A 3. C 4. D 5. B 6.B 7.C 8.C 9.C 10. A

Additional Activity

1. B 2. D 3. E 4. A 5. C

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